

**WHAT IS CLAIMED IS:**

1. A phase-demodulation method for demodulating a phase-demodulated communication signal through a predetermined number of samplings using a digital phase-demodulation algorithm, comprising the steps of:

5 adding one sampling to the digital phase-demodulation algorithm represented by an

equation  $F_k(x) = \sum_{k=0}^{K-1} C_k x^k$ , where  $k$  represents the number of sampling times and

$C_k$  represents a complex constant; and,

demodulating the phase-demodulated communication signal.

2. The phase-demodulation method according to claim 1, wherein the step of adding

10 one sampling for a phase-error minimization to the digital phase-demodulation algorithm is represented by the following equation:

$$\begin{aligned}
 F'_{K+1}(x) &= \sum_{k=0}^{K-1} c_k x^k (\lambda - x) \\
 &= \sum_{k=0}^{K-1} c_k \lambda x^k - \sum_{k=0}^{K-1} c_k x^{k+1} \\
 &= c_0 \lambda + \sum_{k=1}^{K-1} c_k \lambda x^k - \sum_{k=1}^{K-1} c_{k-1} x^k - c_{K-1} x^K \\
 &= c_0 \lambda - c_{K-1} x^K + \sum_{k=1}^{K-1} (c_k \lambda - c_{k-1}) x^k \\
 &\equiv \sum_{k=0}^K d_k x^k
 \end{aligned}$$

where  $k$  represents the number of sampling times,  $C_k$  and  $d_k$  are complex constants, and  $\lambda - x$  indicates the one sampling added.

3. The phase-demodulation method according to claim 2, wherein the phase-error minimization is determined by a value of  $\lambda$  satisfying the following equation:

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$$\begin{aligned}\gamma^2 &= \left| \sum_{k=0}^K d_k^2 \right| \\ &= c_0^2 \lambda^2 + c_{K-1}^2 + \sum_{k=1}^{K-1} (c_k^2 \lambda^2 + c_{k-1}^2 - 2c_{k-1}c_k \lambda) \\ &= \sum_{k=0}^{K-1} c_k^2 \lambda^2 - 2 \sum_{k=1}^{K-1} c_{k-1}c_k \lambda + \sum_{k=0}^{K-1} c_k^2\end{aligned}$$

where  $k$  is the number of sampling times,  $C_k$  and  $d_k$  are complex constants, and  $\gamma$  is a phase error.

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